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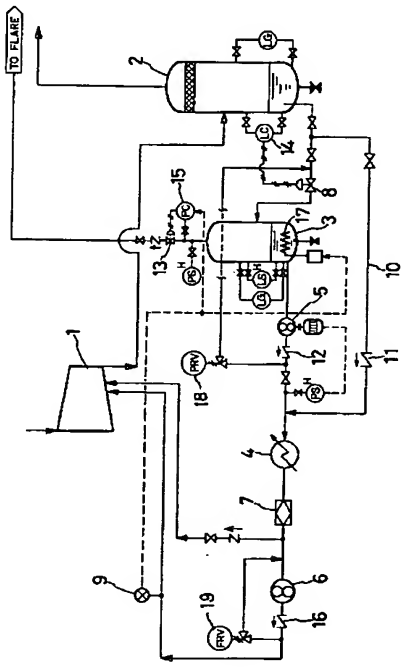
(54)【発明の名称】　油冷式スクリュ圧縮機潤滑油の除ガス装置

(57)【要約】

【目的】　低ランニングコスト下、高効率下で潤滑油中のガス除去の実現を可能とし、以て潤滑油の使用範囲の拡大化、圧縮機冷却性能の向上化を図る。

【構成】　スクリュ圧縮機１、油回収器２及び油冷却器４を備えた油冷式スクリュ圧縮機において、油回収器２から油冷却器４に到る油経路中にガス分離タンク３を設け、このガス分離タンク３内の圧力を圧力調節手段１３で調節することによって、スクリュ圧縮機１の給油ライン中の油粘度を一定に保持する。



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【特許請求の範囲】

【請求項１】　スクリュ圧縮機、油回収器及び油冷却器を備えた油冷式スクリュ圧縮機において、油回収器から油冷却器に到る油経路中に設けられるガス分離タンクと、このガス分離タンク内の圧力を調節することによってスクリュ圧縮機の給油ライン中の油粘度を一定に保持する圧力調節手段とを含むことを特徴とする油冷式スクリュ圧縮機潤滑油の除ガス装置。

【請求項２】　スクリュ圧縮機、油回収器及び油冷却器を備えた油冷式スクリュ圧縮機において、油回収器から油冷却器に到る油経路中に設けられるガス分離タンクと、このガス分離タンク内の圧力を調節することによってスクリュ圧縮機の給油ライン中の油粘度を一定に保持する圧力調節手段と、前記油粘度に応じてガス分離タンクの温度を調節する温度調節手段とを含むことを特徴とする油冷式スクリュ圧縮機潤滑油の除ガス装置。

【請求項３】　ガス分離タンクを側路するバイパス管が付設されてなる請求項１または２に記載の油冷式スクリュ圧縮機潤滑油の除ガス装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、油冷式スクリュ圧縮機における潤滑油中に含まれるガス成分を除去して油の粘度を回復する除ガス装置に関する。

【０００２】

【従来の技術】油冷式スクリュ圧縮機に用いられる潤滑油は、圧縮される取扱ガスと直接接触した高温、高圧の油が循環使用される。従って、油中にガスが溶解するために油の粘度を下げることとなり、現状では、ガスの組成からガス溶解量を予想して運転状態において適正な粘度が確保できるように使用油の粘度グレードを決定してる。ところが実際の運転状態における粘度は不明といってよい。また、ガス中にC_3，C_4，C_5等のガスを多く含む場合は、溶解量が多く、粘度の確保が困難であるため、一般鉱油に替えて合成潤滑油が使用されている。しかし、合成潤滑油は高価であり、かつ、親水性があって取扱に注意を要する等の問題がある。ところで、油に混合している気泡を除去する先行技術が実開昭58－146893号公報によって提案されているが、この内容は、回収した油を油回収器を経て遠心分離機に通すようにしたものであって、油とガスとを油回収器で分離した後、遠心分離機で更に気泡（ガス分）を分離することができるものである。しかしながら、これは、油中に溶け込んでいるガスを分離することはできず、本発明が対象とするものとは本質的に異なるものである。

【０００３】

【発明が解決しようとする課題】ところで油冷式スクリュ圧縮機では、吐出圧力、ガス組成が変動した場合、油の粘度を確保することは決して容易なことではなく、液化しやすいガスでは油中に液で混合することになり、また、ガス中に不飽和ハイドロカーボンを含む場合、圧縮機内の局部的な発熱によってガスが重合することもあって、遠心分離機による分離手段では、ガスの分離を的確に行うことは困難であるし、運転コントロールが難しく、更に親和性の点を考慮して取扱ガスの種別に応じ潤滑油の種類が制約されるなどの問題が依然として解決されないで残されている。

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【０００４】本発明は、このような問題点の解消を図るために成されたものであり、本発明の目的は、回収して再使用する潤滑油からガス分を除去するのに、給油ライン中の圧力、温度の適切な調節を行わせることによって、潤滑油を適正粘度に保ち、低ランニングコスト下ならびに高効率下での実現を可能とし、以て潤滑油の使用範囲の拡大化、圧縮機冷却性能の向上化を図ることにある。

【０００５】

【課題を解決するための手段】本発明は、上記の目的を達成するため以下に述べる構成としたものである。即ち、本発明は、スクリュ圧縮機、油回収器及び油冷却器を備えた油冷式スクリュ圧縮機において、油回収器から油冷却器に到る油経路中に設けられるガス分離タンクと、このガス分離タンク内の圧力を調節することによってスクリュ圧縮機の給油ライン中の油粘度を一定に保持する圧力調節手段とを含んで油冷式スクリュ圧縮機潤滑油の除ガス装置を構成したものである。

【０００６】本発明はまた、スクリュ圧縮機、油回収器及び油冷却器を備えた油冷式スクリュ圧縮機において、油回収器から油冷却器に到る油経路中に設けられるガス分離タンクと、このガス分離タンク内の圧力を調節することによってスクリュ圧縮機の給油ライン中の油粘度を一定に保持する圧力調節手段と、前記油粘度に応じてガス分離タンクの設定温度を調節する温度調節手段とを含んで油冷式スクリュ圧縮機潤滑油の除ガス装置を構成したものである。更に本発明は上述の構成に加えて、ガス分離タンクを側路するバイパス管が付設されてなる油冷式スクリュ圧縮機潤滑油の除ガス装置である。

【０００７】

【作用】本発明に従えば、油回収器に回収される油は、高温度、高圧力下でガスの殆どが分離された後、ガス分離タンクに送られる。このガス分離タンクでは、前記圧力調節手段の作動によって内部の圧力が自動調節される。その結果、油中の残ガスは分離・放出され、一定の粘度に回復した油が油冷却器を経て圧縮機に送り込まれる。従って、潤滑油の粘度が適正に保持されることによって、圧縮機自体の性能も向上する。なお、運転状態によってはガス分離タンクでの除ガス操作を必要としない場合があるが、その際はガス分離タンクを側路するバイパス管を通じて油回収器から油冷却器に直接送油することが可能である。また、前記温度調節手段を併用してガス分離タンク内でのガス分離を促進させることによっ

て、除ガス効果をより高めることができる。

【０００８】

【実施例】以下、本発明の実施例について添付図面を参照しながら説明する。図１は、本発明の実施例に係る油冷式スクリュ圧縮機の除ガス装置の回路図である。スクリュ圧縮機１には、油回収器２，ガス分離タンク３，油冷却器４等を備える除ガス装置が設けられる。油回収器２の油取出口とガス分離タンク３の油取入口とは、液面調節弁８を備える油管によって接続される。ガス分離タンク３は、前記油取入口が側壁中間部に、油取出口が底壁部に、ガス取出口が頂壁部にそれぞれ設けられる圧力容器に形成されて、油取出口が、第１油ポンプ５及び逆止弁１２を直列に介設して有する油管によって油冷却器４の油取入口に接続される一方、ガス取出口には、圧力調節弁１３を備えるガス取出管が接続される。油冷却器４は、油取出口が、フィルタ７，第２油ポンプ６及びチェック弁１６を直列に介設して有する油管によってスクリュ圧縮機１の油取入口に接続される。なお、液面調節弁８，ガス分離タンク３及び第１油ポンプ５からなる直列油管路に対して、逆止弁１１を備えるバイパス管１０が並列接続される。

【０００９】スクリュ圧縮機１の油取入口に接続される油管で実現される給油ラインに対して粘度発信器９が取り付けられる。この粘度発信器９は、給油ライン中の油粘度を電気信号で検出する粘度検出部と、この電気信号を出力発信する発信部とによって形成される。一方、前記液面調節弁８は、油回収器２に取り付けられる液面調節計１４によって弁開度が制御され、また、圧力調節弁１３は、ガス分離タンク３の内部圧力と前記粘度発信器９の粘度とに基づいて制御指令を出力する圧力調節計１５によって開閉制御される。

【００１０】このように構成される除ガス装置の作動は以下に述べる通りである。油回収器２では、油面が液面調節計１４及び液面調節弁８によって一定に保たれ、ガスの殆どが分離された後の高温、高圧の油は、ガス分離タンク３に導かれる。このガス分離タンク３内の圧力は、前記粘度発信器９によって減圧調節され、圧力設定が自動的に成される。この減圧調節により、油中に残存しているガス分は効果的に分離される。この場合、油中のガス分離方法としては、①油を減圧する、②吐出温度を上げて油温度を上げる、③ガス分離タンク３内での保持時間を長くする、があるが、油冷式スクリュ圧縮機の潤滑油ラインでは①油を減圧する方法が最も効果的である。

【００１１】ガスが放出されたガス分離タンク３内の油は、第１油ポンプ５で元の油回収器２の圧力まで昇圧される。この第１油ポンプ５は、吐出圧力を一定に保持するように油圧調節弁１８によって制御される。昇圧された油は、油冷却器４で冷却され、油濾過器７で濾過され、更に、必要に応じて第２油ポンプ６によって昇圧された後、スクリュ圧縮機１に供給される。なお、第２油ポンプ６の吐出圧力は、油圧調節弁１９によって制御され一定に保持される。この場合、給油ラインの圧力、ガス組成が共に設計条件に適合している運転状態のときは、液面調節弁８を閉じ、第１油ポンプ５を停止し、前記バイパス管１０を開通させることによって油回収器２の油を直接スクリュ圧縮機１に供給する。なお、ガス分離タンク３において、油から分離したガスは、圧力調節弁１３を備えるガス取出管によって大気に放出し、または吸込み、低圧ラインに戻す。

【００１２】本発明の他実施例としてガス分離タンク３内にヒータ１７を設けて、油をその粘度に応じて加熱し温度を調節することによる除ガス効果を高める手段、或いはガス分離タンク３内の油を機械的に撹拌して保持時間の短縮を図ったり、油中に窒素等の不活性ガスをバブリングする方法を前記実施例に併用することは好ましい手段である。また、使用する油に関して種類、圧力及び温度の各条件と好ましい粘度との関係が決定できる場合は、粘度発信器による検出に替えて予め圧縮機運転制御用のプログラムに対して所定の温度、圧力条件を組み込んでおくことにより、給油ラインの温度、圧力条件をコントロールして好ましい粘度に保持するようにすることも勿論可能であり、このような手段もまた、本発明の範囲に包含されるものである。

【００１３】

【発明の効果】以上述べたように本発明によれば、油の減圧により油中のガスが放出され、油の粘度が効果的に回復する。これによって、圧縮機の性能が安定的に向上する。しかも、ガスの溶解量、即ち粘度に応じて降圧のための減圧圧力を設定すれば、油給送のための動力が節減でき、ランニングコストの低減効果が大きい。また、本発明の実施によって、各種の潤滑油から最適なものを制約なしに任意に使用できる普遍的な効果も期待できる。

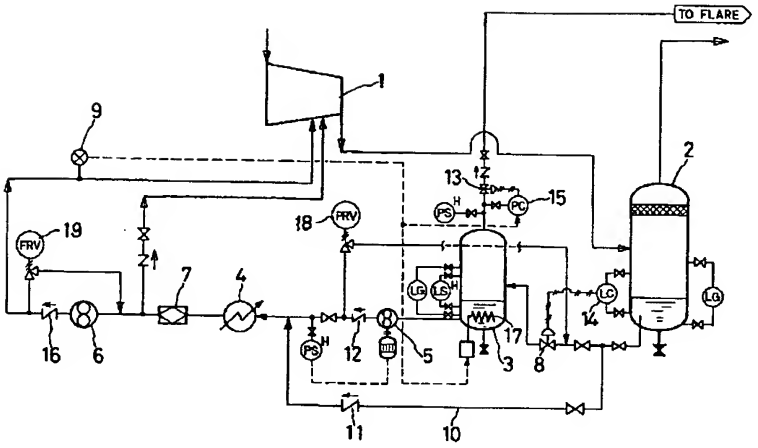
【図面の簡単な説明】

【図１】本発明の実施例に係る油冷式スクリュ圧縮機潤滑油の除ガス装置の回路図である。

【符号の説明】

１…スクリュ圧縮機
２…油回収器
３…ガス分離タンク
４…油冷却器
５…第１油ポンプ
６…第２油ポンプ
８…液面調節弁（油回収器２用）
９…粘度発信器
１０…バイパス管
１３…圧力調節弁（ガス分離タンク３用）

【図１】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* NOTICES *

Bibliography

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(43) [Date of Publication] July 28, Heisei 7 (1995)
(54) [Title of the Invention] ** gas equipment of an oil-injection-type screw-compressor lubricating oil
(51) [International Patent Classification (6th Edition)]

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F04B 39/02

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[Address] 2-3-1, Arai-cho Shinhama, Takasago-shi, Hyogo-ken The Kobe Steel, Ltd. Takasago manufacture within a station
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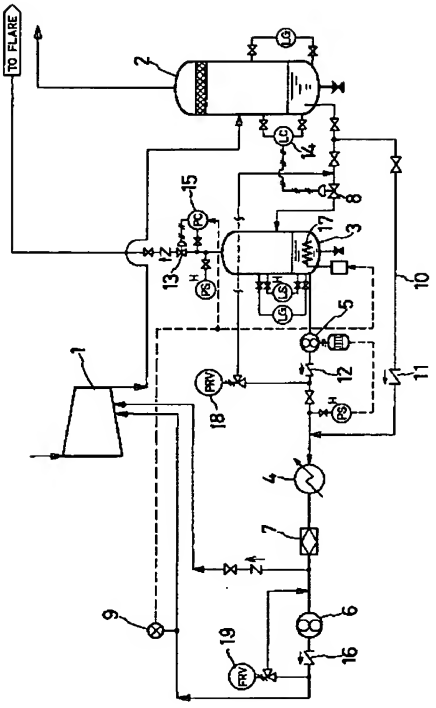
Epitome

(57) [Abstract]
[Objects of the Invention] Implementation of the escape of gas in a lubricating oil is enabled under efficient under a low running cost, with expansion-izing of the use range of a lubricating oil and improvement-ization of the compressor cooling engine performance are attained.
[Elements of the Invention] In the oil-injection-type screw compressor equipped with the screw compressor 1, the oil recovery unit 2, and the oil cooler 4, the oil viscosity in the oil supply line of a screw compressor 1 is uniformly held by forming the gas liberating tank 3 into the oil path to an oil cooler 4 from an oil recovery unit 2, and adjusting the pressure in this gas liberating tank 3 with the pressure accommodation means 13.

[Translation done.]



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CLAIMS

[Claim(s)]
[Claim 1] ** gas equipment of the oil-injection-type screw-compressor lubricating oil characterized by including the gas liberating tank formed into the oil path to an oil cooler from an oil recovery unit in the oil-injection-type screw compressor equipped with the screw compressor, the oil recovery unit, and the oil cooler, and a pressure accommodation means to hold uniformly the oil viscosity in the oil supply line of a screw compressor by adjusting the pressure in this gas liberating tank.
[Claim 2] ** gas equipment of the oil-injection-type screw-compressor lubricating oil characterized by to include the gas liberating tank formed into the oil path to an oil cooler from an oil recovery unit in the oil-injection-type screw compressor equipped with the screw compressor, the oil recovery unit, and the oil cooler, a pressure accommodation means hold uniformly the oil viscosity in the oil supply line of a screw compressor by adjusting the pressure in this gas liberating tank, and a temperature control means adjust the temperature of a gas liberating tank according to said oil viscosity.
[Claim 3] ** gas equipment of the oil-injection-type screw-compressor lubricating oil according to claim 1 or 2 to which it comes to attach the by-path pipe which carries out the by-pass of the gas liberating tank.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the ** gas equipment which removes the gas constituents contained in the lubricating oil in an oil-injection-type screw compressor, and recovers the viscosity of an oil.
[0002]
[Description of the Prior Art] The cyclic use of waste water of the elevated temperature which contacted the handling gas by which the lubricating oil used for an oil-injection-type screw compressor is compressed, and directly, and the high-pressure oil is carried out. Therefore, in order that gas may dissolve into an oil, the viscosity of an oil will be lowered, and in the present condition, it is determined that the amount of gas dissolutions is expected and the viscosity grade of an oil used can secure proper viscosity from the presentation of gas in operational status. However, the viscosity in actual operational status of an unknown flume is good. moreover, the inside of gas -- C3, C4, and C5 etc. -- when many gas is included, there are many amounts of dissolutions, since reservation of viscosity is difficult, it changes to common mineral oil and the synthetic lubricating oil is used. However, the synthetic lubricating oil is expensive, and has a hydrophilic property and has problems, like handling takes cautions. By the way, as these contents let the collected oil pass to a centrifugal separator through an oil recovery unit, after an oil recovery unit separates an oil and gas, air bubbles (a part for gas) are further

separable, although the adv[redacted]ed technology which removes the air b[redacted]es currently mixed to oil is proposed by JP,58-146893,U with a centrifugal separator. However, this cannot separate the gas which has melted into the oil, but the target things [this invention] essentially differ.
[0003]
[Problem(s) to be Solved by the Invention] By the way, when a discharge pressure and a gas presentation are changed in an oil-injection-type screw compressor, By the gas which it is never easy to secure the viscosity of an oil and is easy to liquefy, it will mix with liquid in an oil. moreover, since gas carries out a polymerization by local generation of heat in a compressor when a partial saturation hydrocarbon is included in gas, with the separation means by the centrifugal separator It is left behind without still solving the problem of it being difficult to separate gas exactly, operation control being difficult, and the class of lubricating oil being further restrained according to the classification of handling gas in consideration of the point of compatibility.
[0004] It is for maintaining a lubricating oil at proper viscosity, and enabling implementation under efficient under a low running cost, with attaining expansion-izing of the use range of a lubricating oil, and improvement-ization of the compressor cooling engine performance by accomplishing this invention in order to aim at the dissolution of such a trouble, and making suitable accommodation of the pressure in an oil supply line, and temperature perform, although the purpose of this invention removes a part for gas from the lubricating oil which collects and carries out a reuse.
[0005]
[Means for Solving the Problem] This invention is considered as the configuration described below in order to attain the above-mentioned purpose. That is, this invention constitutes the ** gas equipment of an oil-injection-type screw-compressor lubricating oil including a pressure accommodation means to hold uniformly the oil viscosity in the oil supply line of a screw compressor, in the oil-injection-type screw compressor equipped with the screw compressor, the oil recovery unit, and the oil cooler by adjusting the pressure in the gas liberating tank formed into the oil path to an oil cooler from an oil recovery unit, and this gas liberating tank.
[0006] This invention constitutes the ** gas equipment of an oil-injection-type screw-compressor lubricating oil again including the gas liberating tank formed into the oil path to [from an oil recovery unit] an oil cooler in the oil-injection-type screw compressor equipped with the screw compressor, the oil recovery unit, and the oil cooler, a pressure accommodation means to hold uniformly the oil viscosity in the oil supply line of a screw compressor by adjusting the pressure in this gas liberating tank, and a temperature control means to adjust the laying temperature of a gas liberating tank according to said oil viscosity. Furthermore, this invention is ** gas equipment of the oil-injection-type screw-compressor lubricating oil to which it comes to attach the by-path pipe which carries out the by-pass of the gas liberating tank in addition to an above-mentioned configuration.
[0007]
[Function] If this invention is followed, the oil collected by the oil recovery unit will be sent to a gas liberating tank, after most gas is separated under high temperature and the high-pressure force. In this gas liberating tank, an internal pressure is regulated automatically by actuation of said pressure accommodation means. Consequently, the residue gas in an oil is separated and emitted and the oil recovered to fixed viscosity is sent into a compressor through an oil cooler. Therefore, the engine performance of the compressor itself also improves by holding the viscosity of a lubricating oil proper. In addition, although ** gas actuation with a gas liberating tank may not be needed depending on operational status, it is possible to convey oil to an oil cooler directly from an oil recovery unit through the by-path pipe which carries out the by-pass of the gas liberating tank in that case. Moreover, the ** gas effectiveness can be heightened more by using said temperature control means together and promoting gas separation within a gas liberating tank.
[0008]
[Example] Hereafter, it explains, referring to an accompanying drawing about the example of this invention. Drawing 1 is the circuit diagram of the ** gas equipment of the oil-injection-type

screw compressor concerning the example of this invention. An oil recovery unit 2, the gas liberating tank 3, and ** gas equipment equipped with oil cooler 4 grade are formed in a screw compressor 1. The oil output port of an oil recovery unit 2 and the oil filling port of the gas liberating tank 3 are connected by the oil pipe equipped with the oil-level control valve 8. While the gas liberating tank 3 is connected to the oil filling port of an oil cooler 4 by the oil pipe with which said oil filling port is formed in side-attachment-wall pars intermedia at the pressurized container with which oil output port is established in the bottom wall section, and tubulure is established in a top wall part, respectively, and oil output port interposes the 1st oil pump 5 and a check valve 12 in a serial, and has them, gas fetch tubing equipped with a pressure regulating valve 13 is connected to tubulure. An oil cooler 4 is connected to the oil filling port of a screw compressor 1 by the oil pipe with which oil output port interposes a filter 7, the 2nd oil pump 6, and a check valve 16 in a serial, and has them. In addition, parallel connection of the by-path pipe 10 equipped with a check valve 11 is carried out to the serial oil pipe way which consists of the oil-level control valve 8, a gas liberating tank 3, and the 1st oil pump 5.

[0009] The viscosity transmitter 9 is attached to the oil supply line realized with the oil pipe connected to the oil filling port of a screw compressor 1. This viscosity transmitter 9 is formed of the viscosity detecting element which detects the oil viscosity in an oil supply line with an electrical signal, and the dispatch section which carries out output dispatch of this electrical signal. On the other hand, whenever [valve-opening] is controlled by the oil-level automatic controller 14 by which said oil-level control valve 8 is attached in an oil recovery unit 2, and closing motion control of the pressure regulating valve 13 is carried out by the pressure controller 15 which outputs a control command based on the internal pressure of the gas liberating tank 3, and the viscosity of said viscosity transmitter 9.

[0010] Thus, actuation of the ** gas equipment constituted is as stating below. In an oil recovery unit 2, a fuel level is kept constant by the oil-level automatic controller 14 and the oil-level control valve 8, and the elevated temperature after most gas was separated, and a high-pressure oil are led to the gas liberating tank 3. With said viscosity transmitter 9, reduced pressure accommodation is carried out and setting pressure accomplishes automatically the pressure in this gas liberating tank 3. A part for the gas which remains in an oil is effectively separated by this reduced pressure accommodation. In this case, the approach of lengthening the holding time within ** gas liberating tank 3 which decompresses ** oil and which raises ** discharge temperature and raises oil temperature as the gas separation approach in an oil that ****** decompresses ** oil in lubricating oil Rhine of an oil-injection-type screw compressor is the most effective.

[0011] The pressure up of the oil in the gas liberating tank 3 with which gas was emitted is carried out to the pressure of the original oil recovery unit 2 with the 1st oil pump 5. This 1st oil pump 5 is controlled by the oil pressure control valve 18 to hold a discharge pressure uniformly. It is cooled with an oil cooler 4 and the oil by which the pressure up was carried out is filtered by the oil strainer 7, and further, after a pressure up is carried out by the 2nd oil pump 6 if needed, it is supplied to a screw compressor 1. In addition, the discharge pressure of the 2nd oil pump 6 is controlled by the oil pressure control valve 19, and is held uniformly. In this case, the oil-level control valve 8 is closed at the time of the operational status to which both the pressure of an oil supply line and the gas presentation conform to a design condition, it suspends the 1st oil pump 5, and supplies the oil of an oil recovery unit 2 to the direct screw compressor 1 by making said by-path pipe 10 opened for traffic. In addition, in the gas liberating tank 3, the gas separated from the oil is emitted to atmospheric air with gas fetch tubing equipped with a pressure regulating valve 13, or is inhaled and is returned to low voltage Rhine.

[0012] It is a desirable means to use together the means which heightens the ** gas effectiveness by forming a heater 17 in the gas liberating tank 3 as other examples of this invention, heating an oil according to the viscosity, and adjusting temperature, or the approach of stirring the oil in the gas liberating tank 3 mechanically, and aiming at compaction of the holding time or carrying out bubbling of the inert gas, such as nitrogen, into an oil in said example. moreover , when the relation between the monograph affair of a class , a pressure , and temperature and desirable viscosity can be determine about the oil to be use , control the

temperature of an oil supply and a flow and pressure requirement and also make it hold to desirable viscosity and such [that it be possible natural and] a means be include by the range of this invention by change to detection by the viscosity transmitter and incorporate predetermined temperature and a flow and pressure requirement to the program for compressor operation controls beforehand .

[0013]

[Effect of the Invention] As stated above, according to this invention, the gas in an oil is emitted by reduced pressure of an oil, and the viscosity of an oil is recovered effectively. By this, the engine performance of a compressor improves stably. And if the reduced pressure for pressure lowering is set up according to the amount of dissolutions of gas, i.e., viscosity, the power for oil feed can be reduced and the reduction effectiveness of a running cost is large. Moreover, the universal effectiveness which can use the optimal thing without constraint for arbitration from various kinds of lubricating oils is also expectable with operation of this invention.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the circuit diagram of the ** gas equipment of the oil-injection-type screw-compressor lubricating oil concerning the example of this invention.

[Description of Notations]

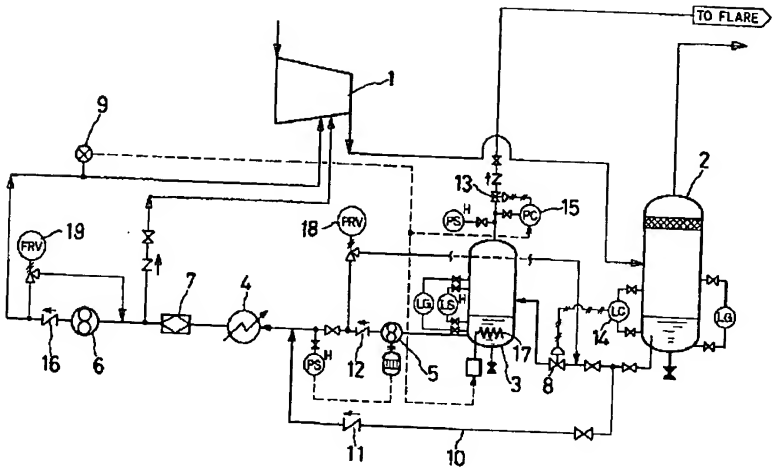
1 -- Screw compressor
2 -- Oil recovery unit
3 -- Gas liberating tank
4 -- Oil cooler
5 -- The 1st oil pump
6 -- The 2nd oil pump
8 -- Oil-level control valve (for oil recovery units 2)
9 -- Viscosity transmitter
10 -- By-path pipe
13 -- Pressure regulating valve (for the gas liberating tanks 3)

[Translation done.]

2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Translation done.]